



**HAMMETT & EDISON, INC.**  
CONSULTING ENGINEERS  
RADIO AND TELEVISION

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September 3, 1993

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SEP 09 1993

**FCC - MAIL ROOM**

Mr. William F. Caton  
Acting Secretary  
Mail Stop Code 1170  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, D.C. 20554

Dear Mr. Caton:

Enclosed is an original and four copies of the Hammett & Edison comments to MM Docket 93-226, *In the Matter of Revision of 47 C.F.R. § 73.208, Reference Points and Distance Computations*. The comment deadline is October 18, 1993, so these comments are timely filed.

Sincerely,

Dane E. Ericksen

tg

Enclosures (5)

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COMMENTS OF  
HAMMETT & EDISON, INC.  
CONSULTING ENGINEERS

MM DOCKET 93-226

IN THE MATTER OF REVISION OF  
47 CFR SECTION 73.208, REFERENCE  
POINTS AND DISTANCE COMPUTATIONS

September 3, 1993



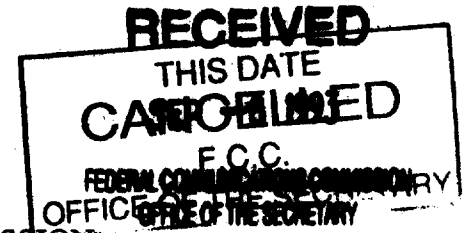
HAMMETT & EDISON, INC.  
CONSULTING ENGINEERS  
SAN FRANCISCO

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SEP - 9 1993

FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554



In the Matter of )

Revision of 47 C.F.R. § 73.208, )  
Reference Points and Distance )  
Computations )

MM Docket No. 93-226

To: The Commission

**COMMENTS OF HAMMETT & EDISON, INC.**

1. The firm of Hammett & Edison, Inc., Consulting Engineers, respectfully submits its comments in the above-captioned proceeding relating to distance calculation rounding practices. Hammett & Edison, Inc. is a professional service organization that has provided consultation to commercial and governmental clients on communications, radio, television, and related engineering matters since 1952. Hammett & Edison has extensive familiarity with the Commission's Rules, has commented on prior Commission rule makings involving distance and bearing calculation issues, and has authored a new and first-time chapter in the Eighth Edition of the *NAB Engineering Handbook* on distance and bearing calculations. Hammett & Edison therefore submits that it is well qualified to comment on the Docket 93-226 issues.

**ALTERNATIVE ONE-TENTH KILOMETER ROUNDING SUGGESTED**

2. Rather than change the rounding practices for calculation of distances between FM broadcast stations from the presently specified rounding to the nearest kilometer, and substitute a two-tier rounding policy, that of rounding to the nearest kilometer for non-short-spaced situations, and rounding to the nearest hundredth kilometer for short-spaced situations, we suggest a simpler

approach: adopt a uniform rounding policy to the nearest tenth kilometer, thus eliminating the wholly unnecessary different rounding policy between FM Branch, which rounds to the nearest kilometer, and TV Branch, which rounds to the nearest tenth kilometer, and also avoiding perpetuation of an inconsistent rounding policy (by not adopting the proposed hundredth-kilometer rounding by FM while retaining a tenth-kilometer policy for TV).

3. Further, we believe that the Commission should combine the currently separate sections in the FM and TV Rules<sup>1</sup> regarding calculation of distances to a combined Subpart H ("Rules Applicable to All Broadcast Stations") Rule section. The Commission should further specify that all distance calculations involving Part 73 and Part 74 stations shall be calculated in accordance with this new, consolidated Rule section.

4. We also urge the Commission to use this proceeding to define how azimuth is to be calculated. We suggest that azimuth should be calculated on the basis of a spherical model of the earth. The present lack of a prescribed method for calculating azimuth causes unnecessary confusion and uncertainty.

5. We note that these recommendations have been made twice before to the Commission, first in the June 9, 1986, Hammett & Edison comments to MM Docket 86-144, and again in the June 1, 1993, Hammett & Edison comments to MM Docket 93-114. In the December 29, 1986, Report and Order to Docket 86-144, the Commission either overlooked or ignored this aspect of the Hammett & Edison comments, as the R&O was completely silent on our rules-in-common and spherical earth azimuth suggestions. The R&O Order to Docket 93-114 is pending, so we do not know if our attempt in that docket to get the Commission to take the eminently sensible approach of a uniform

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<sup>1</sup> Section 73.208 for FM distance calculations; Section 73.611 for TV distance calculations.

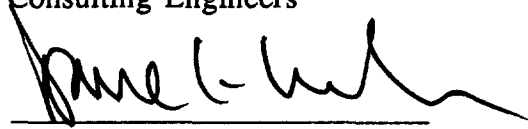
distance rounding policy for all Part 73 and Part 74 services, and to at long last define how azimuth is to be calculated (as the Canadian Department of Communications Rules have done since 1987<sup>2</sup>), will be successful.

#### SUMMARY

6. There is nothing magical about, for example, a 290-kilometer separation between co-channel Class C stations or a 115-kilometer separation between co-channel Class A stations; the current allocations system would work just as well if the adopted numbers had been 289 kilometers and 116 kilometers. We do not agree that substantial interference would be created by short-spacings of less than 0.5 kilometers. To require reporting separations to the nearest hundredth of a kilometer creates precision without accuracy. The alternative changes to the Commission's distance calculation rules suggested in these comments would result in simpler and more straightforward Rules for the calculation of distances and azimuths.

HAMMETT & EDISON, INC.  
Consulting Engineers

By

  
Dane E. Ericksen, P.E.  
Senior Engineer

September 3, 1993

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<sup>2</sup> Canadian Broadcast Procedure No. 13 (BP-13), Section 4.3(c); copy attached, for reference.





**BP-13**  
**ISSUE 2**  
**PROVISIONAL**

**BROADCAST  
PROCEDURE**

**PROTECTION AND  
COVERAGE RULES FOR  
PRIMARY FM  
BROADCASTING STATIONS**

**EFFECTIVE DATE :**  
**AUGUST 6, 1987**

**BROADCASTING REGULATION BRANCH**

**PR-13**  
**2<sup>e</sup> EDITION**  
**PROVISOIRE**

**PROCÉDURE SUR LA  
RADIODIFFUSION**

**RÈGLES DE PROTECTION  
ET DE ZONE DE SERVICE  
DES STATIONS  
DE RADIODIFFUSION  
FM PRIMAIRES**

SEP 16 '87

RLH	PM	WFH	RSJ	WK
EE	DE	GES	RC	DS
RPS	HK	IFS	TEM	EAC
FIS				

**MISE EN VIGUEUR :**  
**LE 6 AOÛT 1987**

**DIRECTION GÉNÉRALE DE LA  
RÉGLEMENTATION DE LA RADIODIFFUSION**

4.2 The distance between reference points is considered to be the length of the hypotenuse of a right angle triangle, one side of which is the difference in latitude of the reference points and the other side the difference in longitude of the two reference points, and shall be computed as follows:

- a) convert latitude and longitude into degrees and decimal parts of a degree. Determine the middle latitude of the two reference points (average the latitudes of the two points);

$$\text{LATM} = \frac{\text{LAT1} + \text{LAT2}}{2}$$

- b) determine the number of km per degree of latitude difference for the actual middle latitude in (a) above;

$$\text{LATK} = 111.108 - 0.566 \cos (2 \text{ LATM})$$

- c) determine the number of km per degree of longitude difference for the actual middle latitude in (a) above;

$$\text{LONGK} = 111.391 \cos (\text{LATM}) - 0.095 \cos (3 \text{ LATM})$$

- d) determine the North-South distance in km;

$$\text{LAT} = \text{LATK} (\text{LAT1} - \text{LAT2})$$

- e) determine the East-West distance in km;

$$\text{LONG} = \text{LONGK} (\text{LONG1} - \text{LONG2})$$

- f) determine the distance between the reference points by the square root of the sum of the squares of the distances obtained,

$$\text{DIST} = (\text{LAT}^2 + \text{LONG}^2)^{1/2}$$

where:

LAT1 & LONG1 = co-ordinates of one location in decimal degrees,  
LAT2 & LONG2 = co-ordinates of second location in decimal degrees,  
LATM = middle latitude between points,  
LATK = km per degree of latitude difference,  
LONGK = km per degree of longitude difference,  
LAT = north-south distance in km,  
LONG = east-west distance in km, and  
DIST = distance between two reference points in km.

In computing the above, sufficient decimal figures shall be used to determine the distance to the nearest km. The method for computing distances provides adequate accuracy for determining distances less than 350 km.

4.3 The azimuth or the bearing between true north and the radial connecting one reference point to the other, shall be calculated as follows:

- a) convert latitude and longitude into degrees and decimal parts of a degree;
- b) determine the arc length in degrees between the two reference locations;

$$d = \cos^{-1} [\sin(\text{LAT}2)\sin(\text{LAT}1) + \cos(\text{LAT}2)\cos(\text{LAT}1)\cos(\text{LONG}1 - \text{LONG}2)]$$

- c) calculate the bearing (if the second location is west of the initial location, subtract the result from 360°; i.e., 360 - BEAR),

$$\text{BEAR} = \cos^{-1} \left[ \frac{\sin(\text{LAT}2) - \sin(\text{LAT}1)\cos(d)}{\cos(\text{LAT}1)\sin(d)} \right]$$

where:

LAT1, LAT2, LONG1 & LONG2 are as specified in Section 4.2;

d = arc length between locations in decimal degrees;

BEAR = angle between true north (0 degrees) and the connecting radial in decimal degrees.

In computing the above, sufficient decimal figures shall be used to determine the bearing to the nearest degree.

## 5. DIRECTIONAL ANTENNAS

- 5.1 Directional antennas may be used by stations operating on unlimited allotments, but their use shall not prevent future increases to maximum parameters. Directional antennas may also be used by stations occupying or proposing the use of limited allotments to render protection to other co-channel and adjacent channel stations.